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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/749,668	12/30/2003	Theodore S. Moise IV	TI-36398	9759
23494	7590	11/14/2005	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, M/S 3999 DALLAS, TX 75265			KALAM, ABUL	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 11/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/749,668

Applicant(s)

MOISE ET AL.

Examiner

Abul Kalam

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09/09/2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 7-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☒ Claim(s) 1-6 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12/30/2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f):
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 12/30/2003.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Election/Restrictions

1. Applicant's election without traverse of Claims 1-6 in the reply filed on 09/09/05 is acknowledged.

Specification

2. The disclosure contains informalities, such as spelling and grammatical errors. Applicant's cooperation is requested in correcting these errors in the specification.

Drawings

3. Figures 1 and 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the examiner does not accept the changes, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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4. Claims 1-6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "asymmetric domains," in Claim 1 line 4, is not clearly defined in the specification or claims, which renders the claim indefinite.

The term "asymmetric domains" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

What does the applicant wish to claim with the term "asymmetric domains"?

5. The claimed "at least about 40% of the domains are functionally oriented," in Claim 1 lines 4-5, renders the claim indefinite, as the metes and bounds of the claim cannot be ascertained because of the open-ended numerical range in the phrase "at least about 40%."

Claims 2-6 are dependent on claim 1 and thus are also rejected.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States

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only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1-2, and 6 are rejected under 35 U.S.C. 102(e) as being anticipated by Fox et al. (US 6,627,930).

With respect to Claim 1, Fox teaches an integrated circuit (col. 6, lines 29-37) including:

An array of ferroelectric memory cells (col. 6, line 29-37), each cell having a capacitor stack (20₂) having a ferroelectric core (22 and 24) with a crystallization in the (001) family, the ferroelectric cores having asymmetric domains, wherein at least about 40% of the domains are functionally oriented with respect to the capacitor stack (Fig. 2B).

Regarding the claimed "crystallization in the (001) family" and "asymmetric domains," Fox discloses in figure 2B a main body (22) of <001> crystallographic texture and a second, thin layer of ferroelectric material, which has a crystallographic texture of <100> (col. 3, lines 37-41).

Regarding the claimed "at least about 40% of the domains are functionally oriented with respect to the capacitor stack," Fox discloses that the second ferroelectric layer (24) is substantially 25% or less of a total thickness of the ferroelectric dielectric layer (col. 8, lines 5-6).

Therefore, if the second layer of the ferroelectric core is 10% (substantially 25% or less) of the total thickness, then the main body (22), with an orientation of <001>, is 90% of the total thickness.

Thus 90% of the domains are functionally oriented with respect to the capacitor stack (Fig. 2B), since the applicant defines functionally oriented domains to mean a polarization vector parallel to the ferroelectric capacitor (pg. 10, lines 7-9).

With respect to Claim 2, Fox teaches the integrated circuit of Claim 1 above, including wherein from about 45 to about 75% of the domains are functionally oriented with respect to the capacitor stack.

In figure 2B, if the second layer (24) of the ferroelectric core is 25% (col. 8, lines 5-6), then the main body (22), with an orientation of $\langle 001 \rangle$, is 75%, and thus 75% of the domains are functionally oriented with respect to the capacitor stack (Fig. 2B).

With respect to Claim 6, Fox teaches the integrated circuit of Claim 1 above, including capacitor stacks formed over metal electrodes (12), wherein the cross section near the top of the metal electrode is about as large or larger than that of the ferroelectric cores.

The expression "filled vias," in Claim 6 line 2, is taken to be a product by process limitation and is given no patentable weight.

The metal electrode, below the capacitor stack, may be formed by processes other than a via, such as forming a metal layer and using a mask to etch the metal electrode.

A product by process claim directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See *In re Fessman*, 180 USPQ

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324, 326 (CCPA 1974); *In re Marosi et al.*, 218 USPQ 289, 292 (Fed. Cir. 1983); *In re Brown*, 459 F.2d 531, 535, 173 USPQ 145, 147 (CCPA 1969); *Buono v. Yankee Maid Dress Corp.*, 77 F.2d 274, 279, 26 USPQ 57, 61 (2d. Cir. 1935); and particularly *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985), all of which make it clear that it is the patentability of the final structure of the product "gleaned" from the process steps, which must be determined in a "product by process" claim, and not the patentability of the process. See also MPEP 2113.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fox '930 as applied to claim 1 above, and further in view of Van Buskirk et al. (US 6,316,797).

With respect to Claim 3, Fox teaches an integrated circuit as described in Claim 1 above including: Wherein the ferroelectric cores are PZT cores (col. 7, lines 12-13).

Thus, Fox teaches all the features of the claim with the exception of the PZT material having a switched polarization (P_{sw}) of at least about $60 \mu\text{C}/\text{cm}^2$.

However, this limitation is non-critical. Note that the specification contains no disclosure of either the *critical nature of the claimed* P_{sw} of at least about $60 \mu\text{C}/\text{cm}^2$ or any unexpected results arising therefrom. Where patentability is aid to base upon particular chosen dimension or upon another variable recited in a claim, the Applicant must show that the chosen dimension is critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

If applicant wishes to prove the critical nature of a switched polarization of at least about $60 \mu\text{C}/\text{cm}^2$, let it be known that Van Buskirk teaches a PZT material with a P_{sw} greater than $20 \mu\text{C}/\text{cm}^2$ (col. 20 lines 25-27), and thus providing an open upper range in which the switched polarization may be 30, 40, 50, or even $60 \mu\text{C}/\text{cm}^2$.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify the integrated circuit of Fox to include a PZT dielectric layer with a switched polarization of at least about $20 \mu\text{C}/\text{cm}^2$ as taught by Van Buskirk, thus allowing each PZT core to store a greater charge per square centimeter and thereby reducing the number of capacitor stacks required in the integrated circuit.

8. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fox '930 as applied to claim 1 above, and further in view of Uchiyama et al. (US 6,831,313).

With respect to Claim 4, the expression "filled via" is taken to be a product by process limitation and is given no patentable weight for reasons set forth above.

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Fox teaches the invention set forth above in Claim 1, including: a metal electrode (14) over the ferroelectric cores (22 and 24), and the metal electrode (14) having a cross section about as large or larger than that of the ferroelectric cores (22 and 24).

Therefore, Fox is shown to teach all the features of Claim 4 with the exception of explicitly disclosing a dielectric layer covering the array of memory cells.

However, Uchiyama teaches in figure 5, a dielectric layer (136) covering an array of memory cells (col. 10, lines 9-13).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the integrated circuit of Fox, to cover the memory cells with a dielectric layer as taught by Uchiyama, to separate active components from one another (col. 10, lines 27-28).

9. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fox '903 as applied to claim 1 above, and further in view of Ren et al. (US 6,507,060).

With respect to Claim 5, Fox teaches the invention set forth above in Claim 1 with the exception of:

Electrodes adjacent opposing sides of the ferroelectric cores having a collective thickness of at least about 200 nm thick.

However, Ren in figure 7, teaches a first conductive film (104) and third conductive film (107) on adjacent opposing sides of the ferroelectric core, wherein each has a thickness within a range of 100-200 nm (column 7, lines 5-6).

Thus, Ren teaches a collective thickness of the electrodes of at least 200 nm.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the integrated circuit of Fox, to make the adjacent electrodes at least 200 nm thick as taught by Ren, because thicker electrodes would prevent oxygen from diffusing into the bottom layer and provide greater stress on the ferroelectric core.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

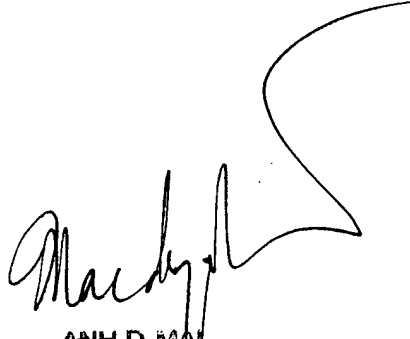
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Abul Kalam whose telephone number is 571-272-8346. The examiner can normally be reached on Monday - Friday, 9 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Abul Kalam
October 31, 2005



ANH D. MAI
PRIMARY EXAMINER